CLAIMS

That which is claimed is:

1. A method for continuous production of carbon nanotubes and fullerenes comprising:
   a. establishing vapor generation zone in an atmosphere of a noble gas by starting and maintaining direct current arc discharge between two graphite electrodes, one of which is a movable consumable anode and another one is a motionless non-consumable cathode;
   b. providing means for maintaining an optimal temperature of anode end surface to suppress formation of large carbon clusters and micro-crystallite carbon particles in vapor generation zone;
   c. providing means for maintaining an optimal concentration of carbon and catalyst vapor in vapor generation zone to ensure optimal yields of carbon nanotubes and fullerenes;
   d. continuous automated feeding of a movable anode into vapor generation zone;
   e. continuous automated feeding of a catalyst for carbon nanotube synthesis in a form of a metal wire or a fine metal powder into vapor generation zone through central perforation in cathode body;
   f. formation of condensables outside of vapor generation zone containing fullerene-related carbon nanotubes and fullerenes;
   g. pneumatic transportation of condensables by a noble gas flow, their cooling, filtration and collection in a storage bin and a noble gas flow re-circulation;
   h. automated discharge of condensables from the storage bin and recovery of carbon nanotubes and fullerenes.

2. The method as set forth in claim 1 wherein the means for maintaining optimal temperature of anode end surface comprise jet flow of a noble gas parallel to anode end surface providing effective removal of just evaporated carbon clusters and facilitating effective evaporation of new clusters.

3. The method as set forth in claim 1 wherein the means for maintaining an optimal concentration of carbon and catalyst vapor in vapor generation zone comprise an admixture of carbon vapor with a noble gas flow coaxial with electrodes and directed from cathode to anode.

4. The method as set forth in claim 1 wherein the means for maintaining an optimal concentration of carbon vapor in vapor generation zone also serve for pneumatic transportation of condensables.

5. The method as set forth in claim 1 wherein precautions are taken to prevent melting of catalyst material inside the cathode body while catalyst is fed into vapor generation zone through perforation in cathode body.

6. A device for continuous production of carbon nanotubes and fullerenes, which represents closed-loop system and includes:

a. an airtight water-cooled chamber comprising an arc discharge section containing vapor generation zone between two graphite electrodes, an anode feeding section containing means to provide automated jointing of separate graphite electrodes and their gradual transportation into vapor generation zone and a catalyst feeding section containing means to provide continuous supply of catalyst through central perforation in cathode body into vapor generation zone;

b. an interchangeable airtight plug-in cartridge containing multiple graphite electrodes for non-stop device operation;

c. an interchangeable airtight plug-in cartridge containing catalyst in a form of metal wire or a fine metal powder for non-stop device operation;

d. means for maintaining an optimal temperature of anode surface and an optimal concentration of carbon vapor in vapor generation zone comprising at least one gas nozzle and at least one gas distributor placed within arc discharge section of the airtight chamber;

e. means for pneumatic transporting of the condensables and noble gas flow re-circulation;

f. a heat-exchanger to maintain constant temperature of the re-circulating noble gas flow comprising means for continuous cleaning heat exchanger inner walls from the condensables;

g. a filter to separate the condensables from a noble gas flow comprising means for filter automatic self-cleaning;

h. a storage bin for filtered condensables comprising means for automated discharge of said condensables outside of a storage bin.

7. The device as set forth in claim 6 wherein automated jointing of separate graphite electrodes is accomplished by at least two mechanisms installed in plug-in cartridge – pushing mechanism providing coaxial position of two electrodes and revolving mechanism jointing said electrodes by the means of female threads on both electrode ends and jointing nipple.

8. The device as set forth in claim 6 wherein gradual transportation of graphite electrodes into vapor generation zone is accomplished by two conveyor transporters equipped with spring clamps tightly embracing said electrodes from the two opposite sides.

9. The device as set forth in claim 6 wherein the means for graphite electrodes gradual transportation into vapor generation zone are used to supply electric current to said electrodes.

10. The device as set forth in claim 6 wherein said catalyst for carbon nanotubes synthesis is supplied in a form of a metal wire or a fine metal powder and the means for its continuous supply into vapor generation zone are presented by any standard or customized wire or powder feeder suitable for the purposes of the present invention.

11. The device as set forth in claim 6 wherein said cathode body has a central perforation for a catalyst feeding ending in a widening and several side perforations ending in the same widening to create protective gas shield and prevent catalyst vapor deposition on the inner sidewalls of the widening.

12. The device as set forth in claim 6 wherein maintaining an optimal temperature of anode end surface comprises two gas nozzles creating two jet counter-flows with their collision point located outside of vapor generation zone.

13. The device as set forth in claim 6 wherein re-circulation of a noble gas flow is accomplished by oil-less gas pump, oil-less gas compressor or other similar means.

14. The device as set forth in claim 6 wherein re-circulating noble gas is separated into at least three flows supplied to arc discharge section, anode feeding section and catalyst feeding section of the airtight chamber.

15. The device as set forth in claim 6 wherein screw conveyer accomplishes continuous cleaning of condensables from the heat exchanger inner walls.

16. The device as set forth in claim 6 wherein deposited on filter surface condensables are cleaned by periodic pulses of reversed gas flow, vibration or any other effective means for filter cleaning.

17. The device as set forth in claim 6 wherein condensables from filter and heat exchanger are collected at the same storage bin to simplify procedure of their discharge.